

permeable electrical member and the aft permeable electrical member, each having an opposing polarity in relation to one another, for accelerating a plurality of ambient atmosphere reaction mass ions,

the at least one ambient atmosphere ion thruster being mounted to the craft for imparting reaction force thereto, said craft having no on-board supply of reaction mass,

at least one means for reversing the polarity of the at least one pair of permeable electrical members for reversing thrust, and

at least one reaction force being imparted to the craft by accelerating the plurality of ambient atmosphere ions.

42. (newly presented) A system as recited in Claim 1 and Claim 41, wherein the ambient atmosphere reaction mass comprises at least one molecular specie selected from the group consisting of helium (He), nitrogen (N₂), oxygen (O₂), free Oxygen (O), methane (CH₄), xenon (Xe), free Nitrogen (N), ionized nitrogen atoms, ionized nitrogen molecules, ionized methane, and ionized oxygen atoms.

REMARKS

Applicant respectfully requests entry of the above amendment, favorable consideration of the below remarks, withdrawal of the rejections, and passage of the pending claims to allowance. Applicant wishes to thank the Examiner for the helpful telephone conferences of January 5 and January 24, 2006. Applicant especially wishes to acknowledge the Examiner's indication in Paragraph 7 of the Office Action that allowable subject matter is present in Claim 10.

In paragraphs 1 and 2 of the Office Action, the Examiner enumerated Claims 5-9, 13-14, 16-17, and 21-40 as being withdrawn from consideration. Applicant acknowledges the withdrawal of these claims but respectfully maintains that the withdrawn claims are allowable as argued in Applicant's election responses of July 15, 2005 and September 16, 2005, especially in light of the above amendment to Claim 1 and the remarks herein.

Rejection of Claims under 35 U.S.C. § 102

In paragraphs 3 and 4 of the Office Action, the Examiner rejected Claims 1-3, 11-12, 15, and 18-20 under 35 U.S.C. 102(b) as being anticipated by the NSTAR thruster used in the Deep Space 1 probe. Applicant respectfully traverses this rejection and maintains that the absence of an on-board reaction mass (fuel source) of the present invention is itself a patentable distinction from the cited art. The NSTAR art (Wikipedia) cited by the Examiner refers to “fuel atoms” in paragraph 1 of the “Method of Operation” section and fuels such as mercury, cesium and xenon in the “Performance” section. Fuels such as these elements must necessarily be carried on-board the spacecraft; thus the NSTAR system does not anticipate the present invention which uses ambient atmosphere gases (i.e. an off-board source) as a fuel mass source for the ion thruster. Claim 1 as originally presented addresses an ion thruster system which is independent of a requirement for an on-board fuel supply by specifying in the preamble that the system is an ambient atmosphere ion thruster system.

Applicant has herein amended Claim 1 to specifically refer to the lack of an on-board reaction mass supply for the spacecraft Ambient Atmosphere Ion Thruster system, as described in the Specification paragraph 0009. Applicant respectfully asserts that the added text is consistent within the claims to clearly declare the purpose of elements of the invention and to facilitate understanding of the presently claimed invention.

Amended Claim 1 now recites:

1. An ambient atmosphere ion thruster system for propelling a craft, said system comprising
 - at least one ambient atmosphere ion thruster,
 - the at least one ambient atmosphere ion thruster comprising at least one pair of permeable electrical members, the at least one pair of permeable electrical members comprising a forward permeable electrical member for receiving ambient atmosphere reaction mass and an aft permeable electrical member, the forward permeable electrical member and the aft permeable electrical member, each having

an opposing polarity in relation to one another, for accelerating a plurality of ambient atmosphere reaction mass ions,

the at least one ambient atmosphere ion thruster being mounted to the craft for imparting reaction force thereto, said craft having no on-board supply of reaction mass, and

at least one reaction force being imparted to the craft by accelerating the plurality of ambient atmosphere ions.

In Claim 1 a “craft” is intended to refer to a “space craft” or “satellite”, a fabricated device conveyed into space or orbit by a launch vehicle such as an unmanned rocket or a manned rocket (e.g. the Shuttle), and placed into orbit around a celestial body, such as the Earth, another planet, or a moon having a sensible atmosphere, in an orbit where an ion thruster system is best functional. The craft could also be propelled through space between celestial bodies under some circumstances when sufficient reaction mass is available. A launch vehicle is presumed to have an on-board supply of reaction mass fuel and is distinguished from the presently claimed invention. Claims 2-3, 11-12, 15, and 18-20 depend from Claim 1 which Applicant respectfully asserts is allowable as amended. Applicant therefore believes that Claims 2-3, 11-12, 15, and 18-20 are allowable by reason of their dependency from an allowable claim. Applicant respectfully requests entry of this amendment, favorable consideration these remarks, withdrawal of these rejections, and the passage to allowance of Claims 1-3, 11-12, 15, and 18-20.

Rejection of Claims under 35 U.S.C. § 103

In paragraphs 5 and 6 of the Office Action, the Examiner rejected Claim 4 under 35 U.S.C. 103(a) as being unpatentable over the NSTAR system. Applicant respectfully traverses this rejection since the presently claimed invention has no on-board reaction mass for use in the thruster system. Since Claim 1 is patentable, Claim 4, depending from allowable Claim 1, either as originally presented or herein amended, is allowable by reason

of its dependency. Applicant requests favorable consideration of these remarks, withdrawal of this rejection, and the passage to allowance of Claim 4.

Allowable Subject Matter

In paragraph 7 of the Office Action, the Examiner objected to Claim 10 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. New Claim 1 is drawn to the subject matter of Claim 41 and includes the limitations of Claim 10 as required by the Examiner.

Applicant respectfully asserts that base Claim 1, both as originally submitted and as herein amended, is allowable as discussed above. Applicant respectfully requests, therefore, that the Examiner allow depending Claim 10 as originally submitted.

Newly Submitted Claims

Applicant has added new Claim 41 which combines the subject matter of Claim 1 as amended above with the allowable elements of Claim 10 as required by the Examiner. Thus, Applicant respectfully requests allowance of that claim.

Applicant has also added Claim 42, which depends from both Claim 1 and Claim 41, to clarify that the ambient atmosphere reaction mass comprises at least the molecules, atoms and ion species identified as examples in the Specification at paragraphs 0009, 0029 and 0038. No new matter is presented. Applicant respectfully requests the allowance of Claim 42.

CONCLUSION

Applicant has herein traversed the rejection of the pending claims and respectfully requests withdrawal of the rejections of Claims 1-4, 11-12, 15, and 18-20. Applicant respectfully requests entry of the herein presented amendment to Claim 1 and added Claims 41 and 42, favorable consideration of the above remarks, allowance of the pending claims as

amended, and passage of amended independent Claim 1, depending Claims 2-4, 10-12, 15, 18-20, and new Claims 41-42 to allowance. The Examiner is cordially invited to telephone the undersigned for any reason which would advance the pending claims to allowance.

Respectfully submitted,



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